WHAT IS CLAIMED IS:

1. A cardiac sensor system implantable in a heart, said system comprising:

means for measuring a cardiac characteristic at at least one point in the cardiac cycle;

means for measuring a myocardial characteristic at at least one point in the cardiac cycle; and

means for transmission of the data from an implanted location in the heart to an external location.

2. A cardiac sensor system as in claim 1, wherein the means for measuring a cardiac characteristic comprises a sensor adapted to measure pressure, differential pressure, volume, temperature, pH, hemocrit, oxygen concentration, regurgitant flow, and cardiac valve area.

3. A cardiac sensor system as in claim 1, wherein the means for measuring a myocardial characteristic comprises a sensor adapted to measure myocardial displacement, myocardial compliance, myocardial dimensions such as thickness, myocardial strain, myocardial expansibility, myocardial contractility, myocardial density, myocardial temperature, myocardial thermal conductivity, myocardial electrical conductivity, myocardial acoustic velocity, myocardial force, and myocardial stress.

4. A cardiac sensor system as in claim 1, further comprising a frame, wherein the cardiac characteristic measuring means and the myocardial characteristic measuring means are locked on the frame.

5. A cardiac sensor system as in claim 4, wherein the frame is implantable in tissue.

6. A cardiac sensor system as in claim 5, wherein the frame is implantable across a cardiac wall.

7. A cardiac sensor system as in claim 1, further comprising a power source control circuitry, and a transmitter, wherein the transmitter is adapted to transmit signals from the sensors to an external receiver.

8. A cardiac sensor system as in claim 7, wherein the power source includes a coil for receiving externally generated power.

9. A cardiac sensor system ad in claim 7, wherein the power source includes a battery.

10. A cardiac sensor system as in claim 7, further comprising a receiver adapted to receive signals generated externally and communicate with the control circuitry to modify or initiate function of at least one of the sensors.

11. A cardiac sensor assembly implantable across a cardiac wall, said assembly comprising:

means for spanning the cardiac wall to provide surfaces on each side of the wall; and

at least one sensor on each surface.

12. A cardiac sensor as in claim 11, wherein the spanning means comprises a pair of anchors joined by a tether.

13. A cardiac sensor as in claim 12, wherein the anchors contact the cardiac wall over a surface area in the range from 1 mm^2 to 100 mm^2.

14. A cardiac sensor as in claim 12, wherein the tether comprises electrical conductors coupling the anchors together, wherein at least some of the sensors are coupled to some of the wires.

15. A cardiac sensor as in claim 11, wherein at least one of the sensors measures a cardiac characteristic selected from the group consisting of pressure, differential pressure, volume, temperature, pH, hemocrit, oxygen concentration, regurgitant flow, cardiac output, and cardiac valve area.

16. A cardiac sensor as in claim 15, wherein at least another of the sensors measures a myocardial characteristic selected from the group consisting of myocardial displacement, myocardial dimensions such as thickness, myocardial strain, myocardial compliance, myocardial expansibility, myocardial contractility, myocardial density,

myocardial temperature, myocardial thermal conductivity, myocardial electrical conductivity, myocardial acoustic velocity, myocardial force, and myocardial stress.

17. A cardiac sensor as in claim 11, further comprising a power source control circuitry, and a transmitter, wherein the transmitter is adapted to transmit signals from the sensors to an external receiver.

18. A cardiac sensor as in claim 17, wherein the power source includes a coil for receiving externally generated power.

19. A cardiac sensor as in claim 17, wherein the power source includes a battery.

20. A cardiac sensor as in claim 17, further comprising a receiver adapted to receive signals generated externally and communicate with the control circuitry to modify or initiate function of at least one of the sensors.

21. A cardiac sensor system implantable across a cardiac wall, said system comprising means for measuring displacement of opposite surfaces of the cardiac wall over time.

22. A cardiac sensor system as in claim 21, wherein the displacement measuring means comprises a first position locator positionable on one surface of the cardiac wall and a second position locator positionable on the other surface of the cardiac wall and means for measuring the displacement between the two locations.

23. A cardiac sensor system as in claim 22, further comprising means for spanning the cardiac wall, wherein the position locators on opposite surfaces of the cardiac wall are connected by the spanning means.

24. A cardiac sensor system as in claim 22, wherein the position locators are independently implantable in the opposite surfaces of the cardiac wall.

25. A cardiac sensor system implantable across a cardiac wall, said system comprising means for measuring expansibility across the wall over time.

26. A cardiac sensor system as in claim 25, further comprising means for spanning the cardiac wall, wherein the expansibility measuring means is disposed on or in the spanning means.

27. A cardiac sensor system as in claim 26, wherein the expansibility measuring means comprises a strain gauge mounted on the wall spanning means, wherein the opposite ends of the wall spanning means are anchored on opposite surfaces of the cardiac wall so that an expansive force exerted by the wall applies a tensile force on the wall spanning means which is measured by the strain gauge.

28. A cardiac sensor system implantable on a cardiac wall, said system comprising means for measuring muscular contractility over a surface of the wall over time.

29. A cardiac sensor system as in claim 28, wherein the muscular contractility measuring means comprises a planar strain gauge.

30. A cardiac sensor system as in claim 29, wherein the planar strain gauge has a circular configuration.

31. A cardiac sensor system as in claim 29, wherein the planar strain gauge has an orthogonal configuration.

32. A cardiac sensor system implantable on or across a cardiac wall, said system comprising means for measuring myocardial compliance.

33. A cardiac sensor system as in claim 32, wherein the compliance measuring means comprises a probe which pushes against the myocardium to measure stiffness as a ratio of force and displacement of the probe.

34. A system for assessing cardiac status of a patient, said system comprising:

a first interface adapted to receive data from cardiac sensors implanted in a patient and produce a plurality of outputs corresponding to said data;

a second interface adapted to receive external data selected from the group consisting of ambient pressure, patient oxygen consumption data, and patient carbon dioxide production data from a breath analyzer; and

a processor adapted to receive data from both interfaces and to calculate one or more cardiac performance values from the received data.

35. A system as in claim 34, wherein the first interface is adapted to receive cardiac characteristic data transmitted from an implanted cardiac sensor and selected from the group consisting of pressure, differential pressure, volume, temperature, pH, hemocrit, oxygen concentration, regurgitant flow, cardiac output, and cardiac valve area.

36. A system as in claim 34, wherein the first interface is adapted to receive myocardial characteristic data transmitted from an implanted cardiac sensor and selected from the group consisting of myocardial displacement, myocardial dimensions such as thickness, myocardial strain, myocardial compliance, myocardial expansibility, myocardial contractility, myocardial density, myocardial temperature, myocardial thermal conductivity, myocardial electrical conductivity, myocardial acoustic velocity, myocardial force, and myocardial stress.

37. A system as in claim 34, wherein the first interface comprises a radiofrequency receiver adapted to receive plurality of different signals from different implanted sensors and input corresponding data to the processor.

38. A system as in claim 34, wherein the second interface is adapted to receive at least inhalation and exhalation volumes, oxygen concentrations, and ambient pressure.

39. A system as in claim 38, wherein the second interface comprises a mouthpiece, a pressure transducer, and analysis and measurement circuitry adapted to input corresponding data to the processor.

40. A system as in claim 34, wherein the processor is adapted to calculate a cardiac hypertrophy value by performing the following steps:

determining a cardiac output value based on oxygen consumption data received from the second interface and blood oxygen concentration data received from the first interface;

determining a myocardial thickness change at two points in the cardiac cycle based on data received from a muscle displacement sensor implanted in the patient's heart through the first interface; and

determining the hypertrophy value based at least in part on the ratio of the cardiac output value and the myocardial thickness change.

41. A system as in claim 34, wherein the processor is adapted to calculate a ventricular performance value by performing the following steps:

determining a cardiac output value based on oxygen consumption data received from the second interface and blood oxygen concentration data received from the first interface;

determining a change in ventricular pressure at two points in the cardiac cycle based on data received from a pressure sensor implanted in a patient's heart through the first interface;

determining a change in a myocardial contraction force at corresponding points in the cardiac cycle based on data received from a muscle contraction force sensor implanted in the patient's heart; and

determining the ventricular performance value based at least in part on the ratio of the determined changes in ventricular pressure and myocardial contraction force.

42. A system as in claim 34, wherein the processor is adapted to calculate a cardiac efficiency value by performing the following steps:

determining a maximum pressure difference between a right ventricle or atrium and a left ventricle or atrium based on pressure data received from pressure sensors in the right and left ventricle or atrium through the first interface;

determining a myocardial thickness change at two points in the cardiac cycle based on data received from a muscle displacement sensor implanted across the myocardium through the first interface;

determining a myocardial contraction force difference at a location on the myocardium based on data received from a muscle contraction force sensor in the patient's heart through the first interface;

determining a cardiac output value based on oxygen consumption data received from the second interface and blood oxygen concentration data received from the first interface; and

determining a cardiac efficiency value based at least in part on the cardiac output value, the determined maximum pressure difference, the determined myocardial thickness change, and the determined myocardial difference contraction force.

43. A method for measuring a cardiac performance value, said method comprising:

measuring a cardiac characteristic at at least one point in the cardiac cycle;

measuring a myocardial characteristic at at least one point in the cardiac cycle; and

determining the cardiac performance value based on a ratio of the measured cardiac characteristic and the measured myocardial characteristic.

44. A method as in claim 43, wherein the cardiac characteristic is selected from the group consisting of intracardiac pressure, intracardiac differential pressure, intracardiac volume, temperature, pH, hemocrit, oxygen concentration, intracardiac regurgitant flow, cardiac output, and cardiac valve area.

45. A method as in claim 43, wherein the myocardial characteristic is selected from the group consisting of myocardial displacement, myocardial dimensions such as thickness, myocardial strain, myocardial compliance, myocardial contractility, myocardial density, myocardial temperature, myocardial thermal conductivity, myocardial electrical conductivity, myocardial acoustic velocity, myocardial force, and myocardial stress.

46. A method as in claim 43, wherein the cardiac characteristic and the myocardial characteristic are measured at the same point on the cardiac cycle.

47. A method as in claim 43, wherein at least one of the cardiac characteristic and the myocardial characteristic is a difference in values measured at two points on the cardiac cycle.

48. A method as in claim 43, wherein both the cardiac characteristic and the myocardial characteristic are differences in values measured at the same two points on the cardiac cycle.

49. A method for calculating a ventricular performance value, said method comprising:

measuring a change in ventricular pressure at two points in the cardiac cycle;

measuring a change in a myocardial contraction force at corresponding points in the cardiac cycle; and

determining the ventricular performance value based at least in part on a ratio between the measured changes in ventricular pressure and myocardial contraction force.

50. A method as in claim 49, wherein the changes in ventricular pressure and myocardial force are measured in the left ventricle.

51. A method as in claim 49, wherein the changes in ventricular pressure and myocardial force are measured in the right ventricle.

52. A method as in claim 49, wherein the change in ventricular pressure is measured with at least one pressure transducer implanted in a ventricular wall.

53. A method as in claim 49, wherein myocardial contraction force is measured across a ventricular septum.

54. A method as in claim 49, wherein the change in a myocardial force is measured with at least one strain gauge implanted in the myocardium.

55. A method as in claim 49, wherein the changes in ventricular pressure and myocardial contraction force are measured with implanted sensors.

56. A method as in claim 55, wherein the implanted sensors are implanted on a common implanted device.

57. A method as in claim 49, wherein the ventricular performance value is measured at successive times in order to monitor changes in the ventricular performance value.

58. A method as in claim 49, wherein the ventricular performance value is the ratio of the change in ventricular pressure over the change in myocardial contraction force.

59. A method as in claim 58, wherein the two points in the cardiac cycle are diastole and systole.

60. A method for calculating a hypertrophy value characteristic of a patient's heart, said method comprising:

determining a cardiac output value;

measuring a myocardial thickness change at two points in the cardiac cycle; and

determining the hypertrophy value based at least in part on the ratio of cardiac output value and the measured myocardial thickness change.

61. A method as in claim 60, wherein the cardiac output value is stroke volume.

62. A method as in claim 61, wherein stroke volume is determined by measuring a quantity of air breathed, a change in oxygen concentration between inhaled air and exhaled air, a blood oxygen concentration in the left ventricle, a blood oxygen concentration in the right ventricle, a pulse rate, and calculating stroke volume based at least in part on these measured quantities.

63. A method as in claim 62, wherein stroke volume is the ratio of mean cardiac output over pulse rate, wherein mean cardiac output is calculated as oxygen consumed by the patient (quantity of air breathed times change in oxygen concentration) divided by the change in blood oxygen concentration between the right and left ventricles.

64. A method as in claim 63, wherein stroke volume is a mean stroke volume calculated as an average of stroke volume values measured over a time from one second to one minute.

65. A method as in claim 64, wherein the change in myocardial thickness is the maximum change in thickness measured at the time of determining the myocardial thickness change.

66. A method as in claim 65, wherein the mean myocardial thickness change is the average of the myocardial thickness measured over a time from one second to one minute.

67. A method as in claim 60, wherein the change in myocardial thickness is measured by a sensor assembly implanted across the myocardial wall.

68. A method as in claim 60, wherein the hypertrophy value is the ratio of the mean stroke volume over the cube of the mean myocardial thickness change.

69. A method of calculating a cardiac efficiency value, said method comprising:

determining a cardiac output value;

measuring a maximum pressure difference between a right atrium and a left ventricle;

measuring a myocardial thickness change at two points in the cardiac cycle;

determining a difference in myocardial contraction force at a location on the myocardium; and

determining a cardiac efficiency value based at least in part on the cardiac output value, the measured maximum pressure difference, the measured myocardial thickness change, and the determined difference in myocardial contraction force.

70. A method as in claim 69, wherein the cardiac output value is stroke volume.

71. A method as in claim 70, wherein stroke volume is determined by measuring a quantity of air breathed, a change in oxygen concentration between inhaled air and exhaled air, a blood oxygen concentration in the left ventricle, a blood oxygen concentration in the right ventricle, a pulse rate, and calculating stroke volume based at least in part on these measured quantities.

72. A method as in claim 71, wherein stroke volume is the ratio of mean cardiac output over pulse rate, wherein mean cardiac output is calculated as oxygen consumed by the patient (quantity of air breathed times change in oxygen concentration) divided by the change in blood oxygen concentration between the right and left ventricles.

73. A method as in claim 69, wherein the maximum pressure difference is measured as the difference between the maximum left ventricular pressure and the minimum right ventricular pressure during a cardiac cycle.

74. A method as in claim 73, wherein the maximum left ventricular pressure and the minimum right ventricular pressure are measured with pressure transducers present simultaneously in the left and right ventricles.

75. A method as in claim 74, wherein the pressure transducers are implanted in a ventricular wall or a septum.

76. A method as in claim 69, wherein the change in myocardial thickness is measured by a sensor assembly implanted across the myocardial wall.

77. A method as in claim 69, wherein the change in myocardial contraction force is the difference between a maximum force at a location and a minimum force at the same location.

78. A method as in claim 69, wherein the difference in myocardial contraction forces is determined with a force transducer implanted on or in the myocardium.

79. A method as in claim 77, wherein the difference in myocardial contraction forces is determined using a myocardial stiffness sensor and a myocardial thickness sensor implanted in or on the myocardium.

80. A method as in claim 69, wherein the cardiac efficiency value is a ratio of a first product of the cardiac output value times the maximum pressure difference and a second product of the change in myocardial contraction force and the change in myocardial thickness.

81. A method of calculating a cardiac elasticity value, said method comprising:

measuring a change in myocardial thickness between two points in a cardiac cycle;

measuring a change in myocardial contraction force at the same two points in the cardiac cycle; and

determining the cardiac elasticity value based at least in part on a ratio of the changes in myocardial thickness and contraction force.

82. A method as in claim 81, wherein the change in myocardial thickness is the maximum change in thickness measured at the time of determining the myocardial thickness change.

83. A method as in claim 82, wherein the mean myocardial thickness change is an average of the change in myocardial thickness measured over a time from one second to one minute.

84. A method as in claim 81, wherein the change in myocardial contraction force is measured across a ventricular septum.

85. A method as in claim 84, wherein the change in a myocardial force is measured with at least one strain gauge implanted in the myocardium.

86. A method as in claim 81, wherein the changes in myocardial thickness and myocardial contraction force are measured with implanted sensors.

87. A method as in claim 86, wherein the implanted sensors are implanted on a common implanted device.

88. A method as in claim 81, wherein the cardiac elasticity value is calculated as the ratio of a first product of the myocardial force change and an average myocardial thickness over a second product of the average myocardial force and the change in myocardial thickness.

89. A method for calculating a ventricular performance value, said method comprising:

measuring a change in ventricular pressure at two points in the cardiac cycle;

measuring a change in a myocardial thickness at corresponding points in the cardiac cycle; and

determining the ventricular performance value based at least in part on a ratio between the measured changes in ventricular pressure and myocardial thickness.

90. A method as in claim 89, wherein the changes in ventricular pressure and myocardial thickness are measured in the left ventricle.

91. A method as in claim 89, wherein the changes in ventricular pressure and myocardial thickness are measured in the right ventricle.

92. A method as in claim 89, wherein the change in ventricular pressure is measured with at least one pressure transducer implanted in a ventricular wall.

93. A method as in claim 89, wherein myocardial thickness is measured across a ventricular septum.

94. A method as in claim 89, wherein the change in a myocardial thickness is measured with at least one strain gauge implanted in the myocardium.

95. A method as in claim 89, wherein the changes in ventricular pressure and myocardial thickness are measured with implanted sensors.

96. A method as in claim 95, wherein the implanted sensors are implanted on a common implanted device.

97. A method as in claim 89, wherein the ventricular performance value is measured at successive times in order to monitor changes in the ventricular performance value.

98. A method as in claim 89, wherein the ventricular performance value is the ratio of the change in ventricular pressure over the change in myocardial thickness.

99. A method as in claim 98, wherein the two points in the cardiac cycle are diastole and systole.